

AD-A119 532

NAVAL FACILITIES ENGINEERING COMMAND ALEXANDRIA VA
ADMINISTRATIVE FACILITIES.(U)

F/G 13/2

MAR 81

UNCLASSIFIED

NAVFAC-DM-34

NL

ADA
1-94-32

END

DATE

FILED

DTIC

Unclassified

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

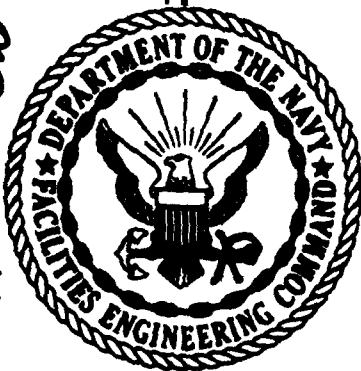
REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER DM-34	2. GOVT ACCESSION NO. AD-A119532	3. RECIPIENT'S CATALOG NUMBER (1)
4. TITLE (and Subtitle) NAVFAC Design Manual DM-34 Administrative Facilities		5. TYPE OF REPORT & PERIOD COVERED Design Criteria Final
6. AUTHOR(s) Naval Facilities Engineering Command 200 Stovall Street Alexandria, VA 22332 (Code 0461)		6. PERFORMING ORG. REPORT NUMBER DM 34
7. PERFORMING ORGANIZATION NAME AND ADDRESS Naval Facilities Engineering Command 200 Stovall Street Alexandria, VA 22332		8. CONTRACT OR GRANT NUMBER(s)
9. CONTROLLING OFFICE NAME AND ADDRESS Naval Facilities Engineering Command (Code 0432) 200 Stovall Street Alexandria, VA 22332		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS Engineering and Design
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)		12. REPORT DATE March 1981
		13. NUMBER OF PAGES 20
		15. SECURITY CLASS. (of this report) Unclassified
		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE
16. DISTRIBUTION STATEMENT (of this Report) Unclassified/Unlimited		
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report) Unclassified/Unlimited		
18. SUPPLEMENTARY NOTES SEP 23 1982 A		
19. KEY WORDS (Continue on reverse side if necessary and identify by block number) Administrative requirements; flagstaffs; housing of vital electronic equipment; modernization of existing facilities; planning requirements; security and restricted areas.		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) Design criteria for use by experienced architects and engineers are presented for facilities covered by category class 600. The contents include criteria for Navy and Marine Corps administration buildings and related facilities. This includes architectural, mechanical and electrical requirements, areas housing vital electronic equipment, and requirements for security and restricted areas, plus designs and types of flagstaffs.		

AD A119532

LIBRARY COPY

**NAVFAC DM 34
MARCH 1981**

ADA119532



ADMINISTRATIVE FACILITIES

DESIGN MANUAL 34

APPROVED FOR PUBLIC RELEASE

**DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
200 STOVALL STREET
ALEXANDRIA, VA. 22332**

82 09 23 057

DISTRIBUTION: (1 copy each unless otherwise specified)

SNDL		FF38		FT2	
23A1	(COMNAVFORAZORES only)	FG2	(Balboa, Harold Holt, Nea Makri, Thurso, Stockton, and Ponce only)	FT6	
24J1				FT13	(Less Millington)
27G				FT18	
39B		FG3	(Cheltenham and East Machias only)	FT19	(San Diego only)
39C1				FT22	
39E		FG6	(Wahisawa and Norfolk only)	FT27	(Idaho Falls only)
42A3		FH3	(Beaufort only)	FT28	
45B		FB6	(Bethesda only)	FT31	
49		FN8	(Cairo only)	FT37	
51A		FN25	(Philadelphia, Portsmouth VA, Camp Lejeune, Oakland, Newport, Great Lakes, and Long Beach only)	FT55	
51B1				FT64	
51B3				FT73	
B2A	(JCS, NSA, DLA, and DNA only)	FJ5		FT74A	(MIT and Texas only)
B5	(USCG only)	FKA6A1		FT74B	(California, Illinois, Rensselaer, Georgia Tech only)
C34	(Holy Loch, Souda Bay only)	FKA6A2			
C37D	(Port Hueneme only)	FKA6A3A		FT78	(2 copies)
E3A		FKA6A3B		V2	
FA6	(Bermuda, Brunswick, Cecil Field, Key West, Jacksonville, Virginia Beach only)	FKA6A9		V3	
FA7	(Guantanamo, Keflavik, Brooklyn, Panama Canal, Mayport, Roosevelt Roads only)	FKA6A12		V5	
FA10		FKA6A15	(Code 521)	V8	
FA18		FKA6A16		V12	
FA23	(Antigua, Brawdy, Buxton, Lewes only)	FKA9		V14	
FA32		FKM8		V15	
FB6		FKM9		V16	(less Camp Smith)
FB7	(Alameda, Fallon, Lemoore, Oak Harbor, Miramar, North Island, Moffet Field only)	FKM12		V17	
FB10	(Adak, Midway only)	FKM13		V23	
FB21		FKM15	(Philadelphia only)	V25	
FB31	(Guam only)	FKN1	(West and Lant only (85 copies each))		
FB34	(Kadena, Sasebo only)	FKN1	(South and North only (50 copies each))	Copy to:	(One copy each unless otherwise indicated)
FB36	(Big Sur, Coos Head, Ferndale, and Pacific Beach only)	FKN1	(Pac only, 25 copies each)	21A	
FB41		FKN1	(Ches only, 25 copies each)	A2A	(ONR only)
FB48		FKN1	(Ches, FPO-1 only)	A3	
FC3	(London only)	FKN2		A4A	
FC4	(Sigonella only)	FKN3	(6 copies each)	A5	
FC5		FKN5	(5 copies each)	A6	(Code LFF)
FC7		FKN8		C7	(Brazil and Chile only)
FC12		FKN10		FD1	
FD2		FKP1B	(less Concord)	FE1	
FE2		FKP1B	(Concord only, 3 copies)	FG1	
FE4	(Adak, Edzell, Hanza, Galeta Island, Homestead, Winter Harbor, Sabana Seca, and Sonoma only)	FKP1E		FKA1A	
FF1	(Washington only)	FKP1J		FKA1B	(2 copies)
FF5		FKP1M		FKA1C	(Code 043 - 50 copies)
FF6		FKP3A		FKA1F	
FF19	(New Orleans, Seattle only)	FKP7		FKN2	(Port Hueneme (Code 156) only)
		FKP8		FR1	
		FKP11			
		FKQ3			
		FKR1A			
		FKR1F	(2 copies)		
		FKR2A	(Dallas only)		
		FKR3A			
		FKR3H			
		FKR4B			
		FKR5			
		FKR7E	(3 copies)		
		FR3			
		FR4			
		FT1			

Additional copies are available from:

Commanding Officer
Naval Publications and
Forms Center
5801 Tabor Avenue
Philadelphia, PA 19120

ABSTRACT

Design criteria for use by experienced architects and engineers are presented for facilities covered by category class 600. The contents include criteria for Navy and Marine Corps administration buildings and related facilities. This includes architectural, mechanical and electrical requirements, areas housing vital electronic equipment, and requirements for security and restricted areas, plus designs and types of flagstaffs.



FOREWORD

This design manual is one of a series developed from an evaluation of facilities in the shore establishment, from surveys of the availability of new materials and construction methods, and from selection of the best design practices of the Naval Facilities Engineering Command, other Government agencies, and the private sector. This manual uses, to the maximum extent feasible, national professional society, association, and institute standards in accordance with NAVFACENGCOM policy. Deviations from these criteria should not be made without prior approval of NAVFACENGCOM Headquarters (Code 04).

Design cannot remain static any more than can the naval functions it serves or the technologies it uses. Accordingly, recommendations for improvement are encouraged from within the Navy and from the private sector and should be furnished to NAVFACENGCOM Headquarters (Code 04).

This publication is certified as an official publication of the Naval Facilities Engineering Command and has been reviewed and approved in accordance with SECNAVINST 5600.16.



W. M. Zobel
Rear Admiral, CEC, U. S. Navy
Commander
Naval Facilities Engineering Command

CONTENTS

	<u>Page</u>
Section 1. ADMINISTRATIVE FACILITIES	34-1
1. RELATED CRITERIA.....	34-1
2. CANCELLATION.....	34-2
3. PLANNING REQUIREMENTS.....	34-2
a. Administration Building.....	34-2
b. Parking.....	34-2
c. Flagstaff.....	34-2
4. ARCHITECTURAL REQUIREMENTS.....	34-2
a. Design Character.....	34-2
b. Design Factors.....	34-2
5. MECHANICAL AND ELECTRICAL REQUIREMENTS.....	34-4
a. Plumbing.....	34-4
b. Heating and Ventilation.....	34-4
c. Electrical.....	34-4
d. Energy Conservation.....	34-5
6. AREAS HOUSING VITAL ELECTRONIC EQUIPMENT.....	34-5
a. General Architectural Requirements.....	34-5
b. Construction.....	34-5
c. Heating and Ventilating Requirements.....	34-6
d. Fire Protection.....	34-6
7. REQUIREMENTS FOR SECURITY AND RESTRICTED AREAS.....	34-6
a. Design Requirements.....	34-6
b. Vaults.....	34-7
c. Physical Security.....	34-7
8. MODERNIZATION OF EXISTING ADMINISTRATIVE FACILITIES.....	34-7
a. Modernization.....	34-7
b. Architectural Requirements.....	34-7
c. Structural Requirements.....	34-8
d. Electrical Requirements.....	34-8
e. Mechanical Requirements.....	34-8
f. Energy Conservation.....	34-9
9. FLAGSTAFFS.....	34-9
a. Definitive Design.....	34-9
b. Wind Loads.....	34-9
c. Types.....	34-9
d. Pull Loads.....	34-10
References.....	Reference-1
APPENDIX A: Metric Conversion Factors.....	A-1

ADMINISTRATIVE FACILITIES

Section 1. ADMINISTRATIVE FACILITIES

1. RELATED CRITERIA. For criteria related to administrative facilities but appearing elsewhere, see the following sources:

<u>Subject</u>	<u>Source</u>
Architecture.....	NAVFAC DM-1
Acoustics	
Design Variations	
Doors and Door Hardware, Security Measures for	
Expansion, Design Considerations for	
Finishes	
Flexibility, Design Considerations for	
Handicapped Provisions	
Limited Life Construction: 15 year Economic Life,	
Mobilization Construction	
Permanent Construction	
Windows, Security Measures for	
Carpet Selection Guide.....	NAVFAC DM-14.2
Civil Engineering.....	NAVFAC DM-5 Series
Exterior Security Measures	
Exterior Services	
Parking	
Color for Naval Shore Facilities.....	NAVFAC P-309
Communications, Navigational Aids, and	
Lighting.....	NAVFAC DM-23
Construction Criteria Manual.....	DOD 4270.1-M
Definitive Designs for Naval Shore Facilities.....	NAVFAC P-272
Flagstaff	
Electrical Engineering.....	NAVFAC DM-4 Series
Alarms	
Security Measures for Lighting	
Facility Planning Factors for Naval Shore Activities.....	NAVFAC P-80
Fire Protection.....	NAVFAC DM-8 and NFPA 101
Department of the Navy Information Security Program	
Regulation.....	OPNAVINST 5510.1F
Mechanical Engineering.....	NAVFAC DM-3 Series
Energy Conservation	
Heating and Ventilating	
Plumbing	
Power Requirements and Mechanical Areas	

Supply Facilities.....NAVFAC DM-32

United States Navy Physical Security Manual.....JPNAVINST 5510.45B

Vaults.....Security Managers
Handbook

2. CANCELLATION. NAVFAC DM-34, Administrative Facilities, of March 1975 is cancelled.

3. PLANNING REQUIREMENTS.

a. Administration Building. The administration building should be centrally located in relation to the activity or subsidiary group that provides its work load, e.g., public work groups, training groups, and supply groups. In addition, the administration building should occupy a prominent position at the activity or the subsidiary group's main approach roads. The site should provide ample area for initial construction with possible expansion, parking, and roadways.

b. Parking. Provide parking facilities at the sides and/or rear of the administration building. Avoid parking in front of and parking directly adjacent to the building. Parking for the staff and the handicapped should be provided near the building entrance. Consider screening parking areas to make them less conspicuous. (See NAVFAC P-272 for further guidance.)

c. Flagstaff. The flagstaff should be the focal point of the station and located in front of the administration building in a dignified, formal setting, removed from the visual distraction of parked vehicles. For other design criteria, see paragraph 9.

4. ARCHITECTURAL REQUIREMENTS.

a. Design Character. Architectural treatment should express the administration building's significance as the activity command and reception center.

b. Design Factors. Administration buildings must be organized for ready access to public areas and general work areas, and for controlled access to more sensitive areas. Although operational requirements can vary plan arrangements, the following areas are common to virtually all administration buildings:

(1) Reception Area. Unless the mission of the administration building requires absolute exclusion of the public, functional arrangements should provide for orderly, pleasant reception, and direction of visitors.

(a) Lobby Area. Provide facilities for information, reception, and waiting.

(b) Toilets. Toilets should be convenient to the lobby and be properly identified.

(2) Private Offices. Assignment should be based on rank and on proximity to related work areas.

(a) Command Suite. Offices of commanding and executive officers should be adjacent to each other and connected to private secretarial offices. These executive offices should be isolated from the building's main traffic flow and enclosed by permanent partitions. The Commanding Officer's office must receive the same careful architectural treatment as the lobby since it, too, serves as a reception area for important visitors.

(b) Other Executive Offices. Other offices should be located consistent with organizational relationship and supervisory requirements.

(3) General Offices. It is desirable to provide large, clear areas for general office space to permit flexibility in reapportionment of spaces. These areas should be designed around a modular scheme for the greatest possible flexibility in arrangement. Where individual offices are required within general office areas, they should be enclosed by lightweight movable partitions. Select movable partitions to satisfy visual, acoustical, and access requirements of the spaces being enclosed.

(4) Communications Areas. Requirements for communications may range from relatively simple installations to complex radio and electronics facilities. Special requirements for areas housing vital electronic equipment are covered in paragraph 6.

(5) Circulation. Stairs, corridors, elevators, and other means of circulation should occupy minimum spaces consistent with efficiency and safety.

(6) Supporting Facilities. Provide for the following areas:

(a) Utilities area.

(b) Storage areas.

(7) Building Design and Materials. The building design and materials shall be in compliance with the Safety and Health Standards set forth in the Occupational Safety and Health Act of 1970 (OSHA), Public Law 91-596 and other DOD - Navy safety and health requirements.

(a) Expansion. In administration building design, consideration of station expansion is particularly important since the expansion may result in a corresponding increase in administrative work load. Where future expansion is contemplated, the service core (that is, reception, circulation, toilet, storage, and mechanical facilities) should be designed to accommodate such expansion.

(b) Square Footage. The building floor area must conform to the net floor and office area allowances given in NAVFAC P-80, Vol. 2, and DOD 4270.1-M.

(8) Colors. Colors shall be in accordance with NAVFAC P-309.

(9) Signage. A sign system shall be provided for direction, identification, and regulation of spaces. Both interior and exterior signs shall be included to orient, direct, and control pedestrian and vehicular traffic.

(10) Access for the Physically Handicapped. The building shall be designed to insure accessibility for the physically handicapped in accordance with DM-1 and DOD 4270.1-M.

5. MECHANICAL AND ELECTRICAL REQUIREMENTS.

a. Plumbing. Provide plumbing in accordance with NAVFAC DM-3 series.

b. Heating and Ventilation. General heating and ventilation should be provided in accordance with NAVFAC DM-3 series.

c. Electrical. Electrical and communication facilities should be provided under the following guidelines. (For additional design criteria, see NAVFAC DM-4 series.)

(1) Communications. Provide telephone service entrances, telephone cabinets, conduit runs, and outlet boxes for telephones. Locate telephones in each office as stipulated in the design program. Provide outlets for public telephones as required. Special requirements for areas housing vital electronic equipment are covered in paragraph 6.

(2) Lighting. Provide lighting in accordance with the design criteria in DOD 4270.1-M. Use high efficiency fluorescent or high intensity discharge (HID) lamps as much as practicable. For reading and writing tasks, use the Equivalent Sphere Illumination (ESI) concept in selecting equipment and layout to provide the most effective lighting considering costs and energy conservation.

(3) Power Requirements. Provide power and control equipment as follows:

(a) Convenience Outlets. For each separate office room with 400 square feet or less of floor area, provide at least one duplex receptacle for each 20 lineal feet of wall space. For each separate office with more than 400 square feet of floor area, provide at least four duplex receptacles for the first 400 square feet and at least two duplex receptacles for each additional 400 square feet or major fraction thereof. Outlets should be placed at suitable locations to serve all parts of the office space. Where large open areas are planned to provide adjustable office spaces, provide floor outlets for telephone and signal circuits, for appliances, and for desk machines such as dictaphones, electric typewriters, and calculators. Duplex receptacles shall also be provided in other spaces, such as corridors, where the use of janitorial equipment or other portable appliances may be anticipated. All receptacles shall be the grounding type.

(4) **Special Systems.** The following special systems should be provided:

(a) **Emergency Lighting.** Provide emergency and exit lighting in accordance with NFPA No. 101, Life Safety Code.

(b) **Clock System.** Specify one electric clock, of the synchronous motor type, in each office and in lobby entrances.

(c) **Fire Alarm System.** An evacuation alarm system, with connection to station fire alarm system, where applicable, should be provided.

d. **Energy Conservation.** The building shall be energy efficient and its design shall take into consideration siting, orientation, outdoor design conditions, indoor design conditions, ventilation and infiltration rates, solar screening, building envelope, and insulation factors. (See NAVFAC DM-3 series for guidance.)

6. AREAS HOUSING VITAL ELECTRONIC EQUIPMENT.

a. **General Architectural Requirements.** Areas housing vital electronic equipment require special treatment to assure operating efficiency, comfort of personnel, and fire safety. (See NAVFAC DM-8.)

(1) **Applicability.** Criteria for communications facilities are contained in NAVFAC DM-23.

(2) **Equipment.** The degree of special treatment varies according to the nature and extent of equipment. Generally, the following terms require additional consideration:

(a) Electronic data processing machines (EDPM).

(b) Permanently installed radio receiver and transmitting equipment.

(c) Teletype equipment.

(3) **Location.** Areas housing vital electronic equipment must be isolated from areas accessible to the public. In one-story buildings, locate these areas away from the main lobby. In two-story buildings, locate these areas on the second floor.

b. **Construction.** The following criteria shall be used in construction planning. Material and building system selection shall be based on:

(1) **Exterior Walls.** Use one of the following:

(a) Concrete masonry units or brick.

(b) Reinforced concrete (where required).

- (c) Lightweight steel frame with metal curtain walls of galvanized, metal asbestos-cement, aluminum, or similar material.

(2) Floors. In areas housing extensive equipment, provide floor systems for electrical flexibility.

(3) Windows. In areas housing vital equipment, windows are prohibited. In a minor installation, such as a message center having limited electronic equipment, fenestration can be provided if such provision does not reduce operating efficiency of the equipment or create a security hazard.

- (a) Windows, if provided, should be placed high.

(b) Double or triple glass windows with thermal barriers can be required, depending on outside design temperature in winter.

c. Heating and Ventilating Requirements. These standards and criteria apply primarily to planning and design of ventilating and air conditioning systems. They fulfill temperature and humidity control requirements for operation of electronic data computer systems, and related areas, such as tape storage rooms, machine repair rooms, administration areas and planning areas supporting an electronic data processing facility. Use NAVFAC DM-3 series for general design criteria for heating, ventilating, and air conditioning equipment. For special heating, ventilating, and air conditioning requirements in communication areas, see NAVFAC DM-23.

d. Fire Protection. See NAVFAC DM-8 for details of fire protection requirements for air conditioning equipment and for electrical distribution installation.

7. REQUIREMENTS FOR SECURITY AND RESTRICTED AREAS.

a. Design Requirements. Some areas in administration buildings have special requirements for excluding unauthorized personnel and for protecting Government property and classified information. (Pertinent security requirements for these areas are contained in numerous documents.) Coordinate with the project sponsor to obtain applicable security requirements. General requirements for physical security are included in OPNAVINST 5510.45B. OPNAVINST 5510.1F shall apply for classified information. All areas requiring security measures should be grouped together to facilitate control. These restricted areas are classified as follows:

(1) Exclusion Area. An exclusion area is an area containing classified information which is of such nature that access to the area constitutes, for all practical purposes, access to classified information.

(2) Limited Area. A limited area is defined as an area containing classified information and in which uncontrolled movement would permit access to the classified information, but within which access may be prevented by escort and other internal restrictions and controls.

(3) Controlled Area. A controlled area is defined as an area within which uncontrolled movement does not permit access to classified information. It is designed for the principal purpose of providing administrative control, safety, or a buffer area of security restriction for limited or exclusion areas. Controlled areas, limited areas, and exclusion areas shall not be designated in any way that outwardly notes their relative sensitivity. Any such area will be identified as a "Restricted Area."

b. Vaults. When new vaults or strong rooms are constructed, they shall be built in accordance with the standards specified in the Security Manager's Handbook.

c. Physical Security. Physical security is that part of an overall security program which is concerned with the physical measures designed to prevent unauthorized access to facilities, equipment, material, and documents and to safeguard them against espionage, sabotage, damage, theft, vandalism, or other covert acts. These physical measures include, but are not limited to, physical barriers, protective lighting, electronic alarm systems, and functional arrangement of spaces to discourage unauthorized access.

8. MODERNIZATION OF EXISTING ADMINISTRATIVE FACILITIES.

a. Modernization. It is intended to bring the livability of existing semipermanent and permanent administration buildings to a level comparable with current standards in new construction. Buildings selected for modernization should be structurally sound, architecturally acceptable, and economically feasible, based on an actual feasibility study comparing replacement cost with new construction. NAVFAC criteria for new construction should be applied to modernization projects to the maximum extent feasible in accordance with good architectural and engineering judgement.

b. Architectural Requirements. The following items provide guidance on basic modernization techniques:

(1) Lobby. The main entrance lobby should be made attractive. New entrance doors and the provision of canopies should be considered where covered entryways are not provided. All vending machines should be removed from the lobby and placed in an area specifically assigned for this function.

(2) Acoustics. Provide acoustical treatment in all areas where there is a high noise level, particularly in data processing and message communication areas and in areas requiring privacy such as conference rooms. (See NAVFAC DM-1.)

(3) Floors. Where the present floor surface is concrete, install resilient floor tile or carpeting with appropriate base. If the present floor is of wood, tile, or linoleum, provide new tile or carpeting only if existing floor is excessively worn and unattractive. The use of carpet shall be in accordance with NAVFAC DM 14.2.

(4) Interior Finishes. Where interior finishes need replacement, they shall conform to the interior finish requirements in DOD 4270.1-M.

(5) Colors. Colors shall conform to NAVFAC P-309.

(6) Signage. To assist the users and visitors of the building, a signage system as described in paragraph 4 shall be provided if none exists.

c. Structural Requirements. Modernization of existing structures shall be investigated and upgraded seismically in accordance with NAVFAC Instruction 11012.133B, Seismic Investigation for Modernization Projects, Requirements for. Where modifications are made to improve functional operations, the structural system can be modified provided the new loading distribution caused by such modifications does not overload existing members. When it is determined that the structural system will not meet the design loads, those members which are considered inadequate should be strengthened, modified, and/or replaced. Structural systems should be inspected, and where deficiencies are noted, maintenance and repair work should be performed.

d. Electrical Requirements. Lighting, power, and telephone systems should be in accordance with the requirements of NAVFAC DM-4 series, and as specified in this chapter.

(1) Reuse. Wiring should be checked for adequacy with respect to current and future load requirements, and upgraded as necessary. Equipment judged to be in safe and operable condition should be reused.

(2) Special Systems. Special systems requirements should be in accordance with NAVFAC DM-32, and as outlined in this chapter.

(3) Fluorescent Fixtures. Where lighting intensities are deficient, and transformer and conduit capacities are limited, lighting fixtures with fluorescent or HID lamps should be used for the required intensity.

e. Mechanical Requirements. The following mechanical requirements should be observed in the modernization of existing buildings:

(1) Plumbing. The number of fixtures as shown in DOD 4270.1-M should be provided. New toilet accessories should be provided where deficiencies exist. Plumbing should conform to the minimum requirements set forth in NAVFAC DM-3 series.

f. Energy Conservation. In an existing building, the site (geographic location), orientation, controls, equipment sizes and selections are essentially fixed. However, the values of other basic parameters such as ventilation, infiltration, building envelope, "U" factor (walls, floor, glass, roof), and shading can be improved and should be evaluated as accurately as possible for energy and cost effective improvement. (See NAVFAC DM-3 series for further guidance.)

9. FLAGSTAFFS.

a. Definitive Design. See NAVFAC P-272 for design and details of flagstaffs.

b. Wind Loads. When designing for wind loads, determine wind pressures on flagstaffs by either of the following equations:

$$(1) \quad P = 0.00307 ChV^2 \quad (1-1)$$

Where: P = pressure on projected areas (psf)
 Ch = height corrected coefficient = raised to the 2/7th power, the product of h divided by 30
 h = height above ground (ft)
 (No corrections below 30 ft.)
 V = wind velocity (mph)
 (0.00307 is coefficient including flat plate resistance and dimensional factors.)

$$(2) \quad P_m = 0.00579 Ch_m V_m^2 \quad (1-2)$$

Where: P_m = pressure on projected area (KSM - kilograms/square meter)
 V_m = wind velocity (KPH - kilometers per hour)
 Ch_m = height correction coefficient - raised to the 2/7th power, the product of h divided by 9.14
 h_m = height above ground (m-meters)
 (No correction below 9.14 meters)

c. Types.

(1) Ground-set. Use the following criteria to establish desirable proportions:

(a) Relationship to Nearest Building. Use poles 50 percent higher than the building for one-story buildings and 25 percent higher than the building for two-story buildings:

(b) Height versus Ball Diameter. Use the following dimensions:

HEIGHT (ft)	BALL DIAMETER (in.)
Up to 30.....	6
40 to 50.....	8
60 to 70.....	10

(2) Vertical Wall-set. The distance between wall brackets shall be a minimum of 10 percent of overall pole length. Poles 30 feet in length or less need two brackets. Use three brackets for poles over 30 feet in length.

d. Pull Loads. Determine pull by using either of the following equations:

$$(1) \quad \text{Pull} = CAV^2 \quad (1-3)$$

Where: Pull = resistance (lb)
C = 0.0003 (a constant factor)
A = area of flag (sq. ft.)
V = wind velocity (mph)

$$(2) \quad \text{Pull} = C_m A_m V_m^2 \quad (1-4)$$

Where: Pull = resistance (N)
V_m = wind velocity (KPH)
A_m = area of flag (sq. M)
C_m = 0.00125 (a constant factor)

REFERENCES

(Publications containing criteria cited in this manual)

American Society of Heating, Refrigeration, and Air Conditioning Engineers, Inc., 345 East 47th Street, New York, NY 10017. ASHRAE Guide and Data Book (latest edition).

Department of Defense, Office of the Assistant Secretary of Defense (Installations and Logistics), Washington, DC. Construction Criteria Manual, DOD 4270.1-M.

Department of the Navy, Naval Facilities Engineering Command, Alexandria, VA 22332. Seismic Investigation for Modernization Projects, Requirements for, NAVFACINST 11012.133B of 17 November 1977.

Department of the Navy, Office of the Chief of Naval Operations, Office of Naval Intelligence, Washington, DC 20350. Security Manager's Handbook.

Department of the Navy, Office of the Chief of Naval Operations, Washington, DC 20350. Department of the Navy Information Security Program Regulation, OPNAVINST 5510.1F of 26 September 1978.

Department of the Navy, Office of the Chief of Naval Operations, Washington, DC 20350. U.S. Navy Physical Security Manual, OPNAVINST 5510.45B of 19 April 1971.

Illuminating Engineering Society, New York, NY 10016. IES Lighting Handbook.

Mace, Ronald L. Accessibility Modifications, North Carolina Department of Insurance, Raleigh, NC 27611.

Mace, Ronald L. An Illustrated Handbook of the Handicapped Section of the North Carolina State Building Code; North Carolina Building Code Council and the North Carolina Department of Insurance, Raleigh, NC 27611

McGraw-Hill Book Co., New York, NY 10020. Time Saver Standards.

National Bureau of Standards, New York, NY 10016. NBS Atmospheric Air Dust Stain Test.

National Fire Protection Associations, Boston, MA 02210. NFPA 101, Life Safety Code.

NAVFACENGCOM Design Manuals and P-Publications

Government agencies may obtain Design Manuals and P-Publications from the U.S. Naval Publications and Forms Center, 5801 Tabor Ave., Philadelphia, PA 19120. TWX: 710-670-1685, AUTOVON: 442-3321. The stock number is necessary for ordering these documents and should be requested from the NAVFACENGCOM Division in your area.

Non-Government organizations may obtain Design Manuals and P-Publications from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.

DM-1	Architecture
DM-3 Series	Mechanical Engineering
DM-4 Series	Electrical Engineering
DM-5 Series	Civil Engineering
DM-8	Fire Protection Engineering
DM-14.2	Carpet Selection Guide
DM-23	Communications, Navigational Aids and Lighting
DM-32	Supply Facilities
P-80	Facility Planning Factors for Naval Shore Activities
P-272	Definitive Design for Naval Shore Activities
P-309	Color for Naval Shore Facilities

Ramsey-Sleeper, Architectural Graphic Standards; John Wiley & Sons, New York, NY 10016

Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402. Occupational Safety and Health Act of 1970 (OHSA), Public Law 91-596.

APPENDIX A

METRIC CONVERSION FACTORS

The following metric equivalents are approximate and were developed in accordance with ASTM E-621. These units are listed in the sequence as they appear in the text.

Conversions are approximate.

400 square feet	=	37.2 square meters
20 feet	=	6100 mm
30 feet	=	9100 mm
40 feet	=	12200 mm
50 feet	=	15200 mm
60 feet	=	18300 mm
70 feet	=	21300 mm
6 inches	=	150 mm
8 inches	=	200 mm
10 inches	=	250 mm

LIMED
-82